Multibus Study for IBM Corporation

Y-BUB   Feb. 1984

MULTIBUS STUDY

FOR

IBM CORPORATION

PRESENTED BY

INPUT

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23 FEBRUARY 1984

INPUT

IBM MULTIBUS STUDY

PRESENTATION AGENDA
23 FEBRUARY 1984

- PROJECT OBJECTIVES

- PROJECT ASSUMPTIONS

- PROJECT METHODOLOGY

- UNIVERSE OF POTENTIAL INTERVIEWS

- INTERVIEWS CONDUCTED

- DATA AND FINDINGS

- CONCLUSIONS

IBM MULTIBUS STUDY
PROJECT OBJECTIVES

- MICROCOMPUTER DEVICE DEFINITION

  - STANDALONE

  - PART OF A SYSTEM

  - DIRECT OR INDIRECT CONNECTION

  - BENEFITS OF CONNECTION

  - MULTIBUS COMPATIBILITY

  - FUNCTIONAL CATEGORIES

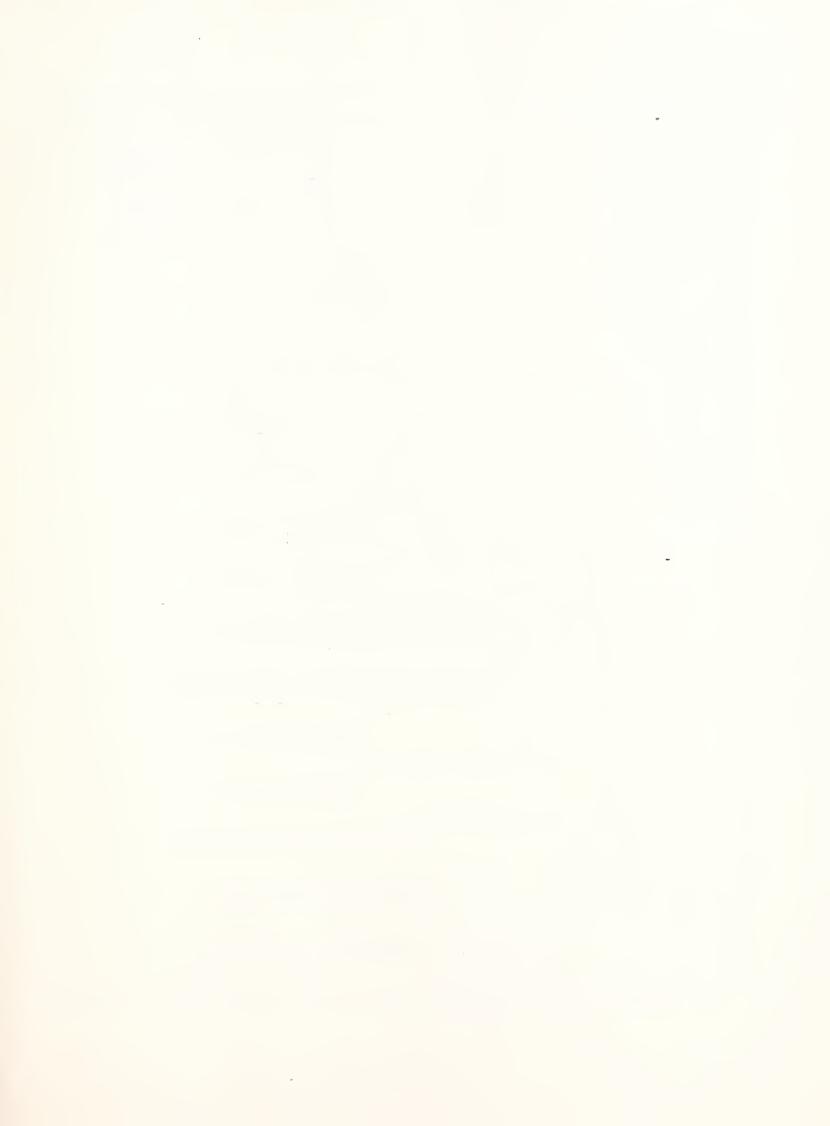## IBM MULTIBUS STUDY
PROJECT OBJECTIVES

- ● MICROCOMPUTER DEVICE INFORMATION

  - VOLUMES AND PROJECTED GROWTH

  - BENEFITS OF HOST SUPPORT

  - MINIMUM DATA RATES

  - SPECIAL CONDITIONS

  - PRIMARY CUSTOMERS

  - CUSTOMER PROFILE

IBM MULTIBUS STUDY
PROJECT OBJECTIVES

- MICROCOMPUTER DEVICE INFORMATION

  - PRICE SENSITIVITY

  - SOFTWARE REQUIREMENTS

  - SYSTEM CONFIGURATION

  - VENDOR CAPABILITIES

  - MAINTENANCE REQUIREMENTS

IBM MULTIBUS STUDY
PROJECT ASSUMPTIONS

DEVICE APPLICATIONS

- MOTION MEASUREMENT AND CONTROL

    - ROBOTICS

- DATA GATHERING

    - SEISMIC AND GEOLOGICAL

    - QUALITY CONTROL INSPECTION

    - FACTORY FLOOR APPLICATIONS

- MEASUREMENT OTHER THAN MOTION

    - OPTICAL SENSORS

    - TACTILE SENSORS

- COMMUNICATION GATEWAYS

    - LOCAL AREA NETWORKS

    - X.25 PACKET NETWORKS

IBM MULTIBUS STUDY
PROJECT ASSUMPTIONS

DEVICE APPLICATIONS

- GRAPHICS

    - BUSINESS

    - SCIENTIFIC AND ENGINEERING

- IMAGE PROCESSING

    - SATELLITE PHOTOGRAPHIC ANALYSIS

    - VIDEO SECURITY

- VOICE SYNTHESIS AND RECOGNITION

- MATHEMATICAL PROCESSING

    - HIGH SPEED ARRAY PROCESSORS

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IBM MULTIBUS STUDY
PROJECT ASSUMPTIONS

- HOST PROCESSORS

  - IBM 4361

  - DEC VAX SERIES

  - DATA GENERAL MV SERIES

  - PRIME 750/850 SERIES

  - OTHER (PERKIN ELMER, GOULD SEL)

IBM MULTIBUS STUDY
PROJECT ASSUMPTIONS

- UNIVERSE OF POTENTIAL INTERVIEWEES

  - MICROCOMPUTER BOARD MAKERS

  - SYSTEM INTEGRATORS

  - MICROCOMPUTER DEVICE END USERS

IBM MULTIBUS STUDY
PROJECT METHODOLOGY

- RESEARCH QUESTIONNAIRE

- TARGET UNIVERSE OF POTENTIAL INTERVIEWEES

- VENDOR INTERVIEWS

    - TELEPHONE

    - ON SITE

- EXPERT USER INTERVIEWS

- SECONDARY RESEARCH

- DATA TABULATION AND ANALYSIS

- PRESENTATIONS

    - BOEBLINGEN, GERMANY
    - WHITE PLAINS, NY

IBM MULTIBUS STUDY
UNIVERSE OF POTENTIAL INTERVIEWEES

NUMBER OF POTENTIAL INTERVIEWEES

- General   67

    -    System Integrators   31

    -    Single-Board Computer Vendors   8

    -    Board Vendors   28

- Specific Applications   47

    -    Robotics   13

    -    Vision Systems   8

    -    Computer Numerical Control   2

    -    Speech Recognition Systems   12

    -    Voice Synthesis/Recognition Boards   3

    -    Communications   7

    -    Industrial Bar Code   2

- Total Universe of Potential Interviewees   114

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IBM MULTIBUS STUDY

TARGET VENDOR POPULATION

I. GENERAL

A. SYSTEMS INTEGRATORS

AMF Logic Sciences, Houston, TX.

Analogic, Wakefield, MA.

Applicon, Burlington, MA.

ASK Computer Systems, Los Altos, CA.

Auto-Trol Technology, Denver, CO.

Bridge Communications, Cupertino, CA.

C3, Reston, VA.

CADLINC, Elk Grove, IL.

Cadmus Computer, Lowell, MA.

Cadnetics, Boulder, CO.

Century Computer, Dallas, TX.

CGX, Acton, MA.

CAE Systems, Sunnyvale, CA.

Computer Consoles, Rochester, NY.

Computervision, Bedford, MA.

Daisy Systems, Sunnyvale, CA.

A.   SYSTEMS INTEGRATORS - (cont'd)

    Gerber Systems Technology, South Windsor, CT.

    Intergraph, Huntsville, AL.

    LISP Machine, Culver City, CA.

    Masscomp, Westford, MA.

    McAuto, St. Louis, MO.

    Mentor Graphics, Portland, OR.

    Metheus, Hillsboro, OR.

    Metier Management Systems, Houston, TX.

    Orcatech, Ottawa, Canada

    Racal-Redac, Littleton, MA.

    Scientific Calculations, Fishers, NY.

    Sigma Design West, Englewood, CO.

    Spectra Graphics, Newbury Park, CA.

    Star Technologies, Portland, OR.

    Telesis Systems, Chelmsford, MA.

B.   SINGLE-BOARD COMPUTERS FOR INDUSTRIAL APPLICATION

Central Data, Champaign, IL.

Comark, Medfield, MA.

Digital Microsystems, Oakland, CA.

Diversified Technology, Ridgeland, MS.

Monolithic Systems, Englewood, CO.

Omnibyte, West Chicago, IL.

Wintek, Lafeyette, IN.

Zendex Corp, Dublin, CA.

C.   BOARD VENDORS

AIM Technology, Santa Clara, CA.

Analog Devices, Norwood, MA.

Bubbl-Tec, Dublin, CA.

Codata Systems, Sunnyvale, CA.

Cosmos Systems, Sunnyvale, CA.

CYB Systems, Austin, TX.

Data Translation, Marlboro, MA.

Datel-Intersel, Mansfield, MA.

Edge Microsystems, Sunnyvale, CA.

EMM/SESCO, Chatsworth, CA.

ETI Micro, Dublin, CA.

Forward Technology, Santa Clara, CA.

C. BOARD VENDORS - (con'td)

Heurikon, Madison, WI.

Intel, Santa Clara, CA.

Logitech, Redwood City, CA.

Matrox Electronic Systems, Quebec, Canada

MDB Systems, Orange, CA.

Measurement Systems & Controls, Orange, CA.

Microbar Systems, Palo Alto, CA.

Micro Industries, Westerville, OH.

Midwest Micro Tek, Minneapolis, MI.

National Semiconductor, Santa Clara, CA.

Pacific Microcomputers, Cardiff, CA.

P.P.M. Cleveland, OH.

Rastor Graphics, Tigard, OR.

RCA, Somerville, NJ.

Relms, San Jose, CA.

SBE, Emeryville, CA.

II.   SPECIFIC APPLICATIONS

A.   ROBOTICS

Advanced Robotics, Hebron, OH.
American Robots, Pittsburgh, PA.
ASEA, Milwaukee, WI.
Cincinnati Milacron, Cincinnati, OH.
Control Automation, Princeton, NJ.
Copperweld Robotics, Hebron, OH.
Devilbiss, Toledo, OH.
Intellidex, Corvallis, OR.
International Robomation/Intelligence, Carlsbad, CA.
Nova Robotics, East Hartford, CT.
Prab Robots, Kalamazoo, MI.
Unimation (Westinghouse), Pittsburgh, PA.
United States Robots, Pittsburgh, PA.

B.   VISION SYSTEMS

Automatix, Billerica, MA.
Everett/Charles Automation Modules, Rancho Cucamonga, CA.
General Electric, Syracuse, NY.
Machine Intelligence, Menlo Park, CA.
Object Recognition Systems, Princeton, NJ.
Octek, Burlington, MA.
Optical Recognition Systems, New York, NY.
Perceptron, Farmington Hills, MI.

C.   COMPUTER NUMERICAL CONTROL

Bendix, Lewisburgh, WV.
General Numeric, Elk Grove Village, IL.

D.   SPEECH RECOGNITION SYSTEMS

Auricle, Cupertino, CA.
Centigram, Sunnyvale, CA.
Excalibur Technologies, Albuquerque, NM.
Hitachi America, Ltd., Torrance, CA.
Interstate Electronics, Anaheim, CA.
NEC Electronics USA, Natick, MA.
Perception Technology, Canton, MA.
Scott Instruments, Denton, TX.
Threshold Technology, Delran, NJ.
Verbex, Bedford, MA.
Votan, Hayward, CA.
Weitek, Santa Clara, CA.

E.   VOICE SYNTHESIS/RECOGNITION BOARDS

Beco, New Kent, VA.
General Digital Corp., East Hartford, CT.
Speech Plus, Mountain View, CA.

F.   COMMUNICATIONS

Associated Computer Consultants, Santa Barbara, CA.

Concord Data Sytems, Lexington, MA.

Excelan, San Jose, CA.

Gandalf, Wheeling, IL.

Intecom, Allen, TX.

Interlan, Westford, MA.

Thomas Engineering Co., Concord, CA.

G.   INDUSTRIAL BAR CODE

Intermec, Lynwood, WA.

MIS Data, Costa Mesa, CA.

IBM MULTIBUS STUDY
INTERVIEWS

- VENDOR INTERVIEWS   <u>NUMBERS</u>

    - MICROCOMPUTER BOARD MAKERS   15

    - SYSTEM INTEGRATORS   20

    - BOARD MAKER/SYSTEM INTEGRATORS   <u>16</u>

    - TOTAL VENDOR INTERVIEWS   51

- VENDOR INTEVIEW METHODS

    - TELEPHONE   46

    - ON-SITE   <u>5</u>

    - TOTAL VENDOR INTERVIEWS   51

- EXPERT USER INTERVIEWS (TELEPHONE)   2

IBM MULTIBUS STUDY
INTERVIEWS

RESPONDENT PROFILE

TITLE	PERCENT
● PRESIDENTS	8
● VICE PRESIDENTS	12
● DIRECTORS	24
● MANAGERS	41
● ENGINEERS/SPECIALISTS	15

MICROCOMPUTER BOARD MAKERS - 15

COMPANY	TITLE
Bubbl-Tec	Chief Engineer
Central Data Corp.	Manager Technical Support
ETI Micro	President
Forward Technology	Director Product Marketing
Logitech	Software Engineer
MDB Systems	Product Support Manager
Metacomp	Director, Marketing
Microbar Systems	Director, Sales & Marketing
Micro Industries	Vice President, Marketing & Sales
Omnibyte	Marketing Manager
Orcatech	Vice President, Marketing
PPM	President
SGS Semiconductor	Director, Systems Marketing
Threshold Technology	Product Marketing Manager
Wintek	President

SYSTEM INTEGRATORS - 20

COMPANY	TITLE
AMF Logic Sciences	Vice President Sales & Marketing
Automatix	Product Line Manager (Founder)
Auto-Trol Technology	Director, Systems Development
CADMUS Computer	Vice President Marketing
Cadnetics	Product Support Specialist
CAE Systems	Vice President Operations & Support
Computervision	Director, Systems Development
Daisy Systems	Manager, Corporate Communications
Digital Microsystems	Director, National Accounts
Diversified Technology	Manager, Board Products
Intellidex	Product Support Manager
Metheus	Advanced Product Planner
Metier Management Systems	Director, Marketing
Object Recognition Systems	Director Marketing
Perceptron	Product Specialist
Prab Robots	Manager, Sales
Scientific Calculations	Product Manager
Spectragraphics	Industry Marketing Manager
Star Technologies	Director, Corporate Communications
Telesis	Manager, Product Promotion

BOARD MAKERS/SYSTEM INTEGRATORS - 16

COMPANY	TITLE
Analogic	Applications Engineer
ASEA	Project Engineer
Bridge Communications	Product Marketing Manager
Century Computer	Director, Sales & Marketing
CGX	Product Sales Manager
Comark	Product Marketing Manager
Computer Consoles	Product Marketing Manager
General Digital	Vice President, Marketing
Intel	Strategic Marketing Manager
Interlan	Product Specialist
Masscomp	Marketing Support Manager
Matrox Electronic Systems	Sales Manager
Mentor Graphics	Product Line Manager
Monolithic Systems	Product Line Manager
Octek	Product Marketing Manager
Zendex	Director, Sales & Marketing

IBM MULTIBUS STUDY
INTERVIEWS

ON-SITE INTERVIEWS

COMPANY	LINE OF BUSINESS
AUTOMATIX	ROBOTICS, VISION SYSTEMS
CGX	CAE/CAD/CAM WORKSTATIONS
COMARK	FACTORY FLOOR AUTOMATION
INTERLAN	LOCAL AREA NETWORKS
MASSCOMP	GRAPHICS WORKSTATIONS

IBM MULTIBUS STUDY
INTERVIEWS

EXPERT USERS

COMPANY	LINE OF BUSINESS	TITLE
FORD AEROSPACE PALO ALTO, CA	SIGNAL DETECTION EQUIPMENT INDUSTRIAL CONTROLS TELECOMMUNICATIONS	DIRECTOR CORPORATE SYSTEM
PSR SYSTEMS INC. CHICAGO, IL	NUCLEAR POWER PLANT CONTROLS	PRESIDENT -

IBM MULTIBUS STUDY
DATA AND FINDINGS

DISTRIBUTION OF VENDOR INTERVIEWS

	NUMBER	PERCENT
MICROCOMPUTER BOARD MAKERS	15	30
SYSTEM INTEGRATORS	20	39
BOTH	16	31
TOTAL VENDOR INTERVIEWS	51	100

IBM MULTIBUS STUDY
DATA AND FINDINGS

APPLICATION AREAS

- INDUSTRIAL AUTOMATION VS. OFFICE AUTOMATION

- APPLICATIONS FOUND

    - FACTORY FLOOR

    - MANUFACTURING PROCESSES

    - INDUSTRIAL CONTROLS

    - SCIENTIFIC AND ENGINEERING DESIGN

    - HARSH ENVIRONMENTS

    - HARD INDUSTRIES

- APPLICATIONS NOT FOUND.

    - EXECUTIVE AND ADMINISTRATIVE OFFICE

    - SOFT INDUSTRIES

IBM MULTIBUS STUDY
DATA AND FINDINGS

MICROCOMPUTER BOARDS

APPLICATION AREAS	PERCENT
DATA GATHERING	16
GRAPHICS	16
MOTION MEASUREMENT AND CONTROL	16
COMMUNICATION GATEWAY	14
IMAGE PROCESSING	11
MEASUREMENT, OTHER THAN MOTION	10
MATHEMATICAL PROCESSING	9
VOICE SYNTHESIS/RECOGNITION	8
	100

MICROCOMPUTER SYSTEMS

APPLICATION AREAS	PERCENT
GRAPHICS	20
DATA GATHERING	17
COMMUNICATION GATEWAY	14
MOTION MEASUREMENT AND CONTROL	12
IMAGE PROCESSING	12
MATHEMATICAL PROCESSING	12
MEASUREMENT OTHER THAN MOTION	10
VOICE SYNTHESIS/RECOGNITION	3
	100

IBM MULTIBUS STUDY
DATA AND FINDINGS

PRIMARY CUSTOMERS

1. OEM'S AND SYSTEM INTEGRATORS

2. CAD/CAM USERS

3. FACTORY FLOOR AUTOMATION

4. CONTROLS FOR PROCESS MANUFACTURING INDUSTRIES

5. SEISMIC OR GEOLOGICAL

6. MEDICAL INSTRUMENTATION

7. OFFICE AUTOMATION

<u>IBM MULTIBUS STUDY</u>
<u>DATA AND FINDINGS</u>

I. OEM'S AND SYSTEM INTEGRATORS

• PRIMARY CUSTOMER OF

    - BOARD MAKERS

• APPLICATIONS

    - COMMUNICATION GATEWAY

    - DATA GATHERING

    - GRAPHICS

    - MOTION MEASUREMENT AND CONTROL

IBM MULTIBUS STUDY
DATA AND FINDINGS

2. CAD/CAM USERS

- PRIMARY CUSTOMER OF

  - SYSTEM INTEGRATORS

- APPLICATIONS

  - COMMUNICATION GATEWAY

  - DATA GATHERING

  - GRAPHICS

  - MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

3. FACTORY FLOOR AUTOMATION

● PRIMARY CUSTOMER OF

    -   SYSTEM INTEGRATORS

● APPLICATIONS

    -   DATA GATHERING

    -   MEASUREMENT OTHER THAN MOTION

    -   MOTION MEASUREMENT AND CONTROL

IBM MULTIBUS STUDY
DATA AND FINDINGS

4. CONTROLS FOR PROCESS MANUFACTURING INDUSTRIES

- PRIMARY CUSTOMER OF

    - BOARD MAKERS

    - SYSTEM INTEGRATORS

- APPLICATIONS

    - COMMUNICATION GATEWAY

    - DATA GATHERING

    - GRAPHICS

    - MOTION MEASUREMENT AND CONTROL

IBM MULTIBUS STUDY
DATA AND FINDINGS

5.   SEISMIC OR GEOLOGICAL

●   PRIMARY CUSTOMER OF

    -    SYSTEM INTEGRATORS

●   APPLICATIONS

    -    DATA GATHERING

    -    GRAPHICS

    -    IMAGE PROCESSING

    -    MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

6.   MEDICAL INSTRUMENTATION

• PRIMARY CUSTOMER OF

    - BOARD MAKERS

    - SYSTEM INTEGRATORS

• APPLICATIONS

    - DATA GATHERING

    - GRAPHICS

    - IMAGE PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

7.   OFFICE AUTOMATION

●   PRIMARY CUSTOMER OF

    -   BOARD MAKERS

    -   SYSTEM INTEGRATORS

●   APPLICATIONS

    -   COMMUNICATION GATEWAY

    -   GRAPHICS

IBM MULTIBUS STUDY
DATA AND FINDINGS

PRIMARY CUSTOMERS

1. OEM'S AND SYSTEM INTEGRATORS

2. CAD/CAM USERS

3. FACTORY FLOOR AUTOMATION

4. CONTROLS FOR PROCESS MANUFACTURING INDUSTRIES

5. SEISMIC OR GEOLOGICAL

6. MEDICAL INSTRUMENTATION

7. OFFICE AUTOMATION

PRIMARY CUSTOMER

	OEM'S/SYSTEM INTEGRATOR'S	CAD/CAM USERS	FACTORY FLOOR AUTOMATION	MANUFACTURING PROCESS CONTROL	SEISMIC/GEOLOGICAL	MEDICAL	OFFICE AUTOMATION
VENDORS							
BOARD MAKER	X			X		X	X
SYSTEM INTEGRATOR		X	X	X	X	X	X
APPLICATIONS							
MOTION MEASUREMENT AND CONTROL	X		X	X			
DATA GATHERING	X	X	X	X	X	X	
MEASUREMENT OTHER THAN MOTION			X				
COMMUNICATION GATEWAY	X	X		X			X
GRAPHICS	X	X		X	X	X	X
IMAGE PROCESSING			X		X	X	
VOICE SYNTHESIS/ RECOGNITION							
MATHEMATICAL PROCESSING		X			X		

IBM MULTIBUS STUDY
DATA AND FINDINGS

BUS STRUCTURE COMPATIBILITY

- BOARDS

    - MULTIBUS

    - Q-BUS

    - UNIBUS

    - CUSTOM/PROPRIETARY BUS

- SYSTEMS

    - MULTIBUS

    - UNIBUS

    - Q-BUS

    - CUSTOM/PROPRIETARY BUS

IBM MULTIBUS STUDY
DATA AND FINDINGS

BUS STRUCTURE COMPATIBILITY

● MULTIBUS AS AN INDUSTRY STANDARD

- TECHNICAL CAPABILITY

- SUPPORT FROM LEADING VENDORS

  . MULTIBUS PRODUCTS: 1200 +
  . VENDORS: 200 +

- IEEE APPROVAL #796

- EVOLUTION TO MULTIBUS II

BUS STRUCTURE COMPATIBILITY

APPLICATIONS	MICROCOMPUTER BOARDS (%)					
	MULTI-BUS	Q BUS	UNI-BUS	CUST/PROP	OTHER*	TOTAL
MOTION MEASUREMENT AND CONTROL	51	13	10	10	16	100
DATA GATHERING	50	13	13	10	15	100
MEASUREMENT OTHER THAN MOTION	45	17	10	7	19	100
COMMUNICATION GATEWAY	53	13	8	8	21	100
GRAPHICS	48	14	7	14	16	100
IMAGE PROCESSING	42	18	9	9	21	100
VOICE SYNTHESIS/ RECOGNITION	50	10	15	5	20	100
MATHEMATICAL PROCESSING	52	12	8	12	16	100
TOTAL MICROCOMPUTER BOARDS	49	14	10	10	18	100

* OTHER INCLUDES: VERSABUS, VMEBUS, S100BUS, STDBUS

IBM MULTIBUS STUDY
DATA AND FINDINGS

BUS STRUCTURE COMPATIBILITY

APPLICATION	MICROCOMPUTER SYSTEMS (%)					
	MULTI-BUS	UNI-BUS	Q BUS	CUST/PROP	OTHER*	TOTAL
MOTION MEASUREMENT AND CONTROL	45	10	15	20	10	100
DATA GATHERING	47	13	13	16	12	100
MEASUREMENT OTHER THAN MOTION	44	11	17	11	18	100
COMMUNICATION GATEWAY	52	15	11	7	15	100
GRAPHICS	45	13	16	11	16	100
IMAGE PROCESSING	41	18	14	14	15	100
VOICE SYNTHESIS/ RECOGNITION	50	20	10	10	10	100
MATHEMATICAL PROCESSING	62	14	5	10	10	100
TOTAL MICROCOMPUTER SYSTEMS	48	14	13	12	14	100

* OTHER INCLUDES: VERSABUS, VMEBUS, S100BUS, STDBUS

IBM MULTIBUS STUDY
DATA AND FINDINGS

VOLUMES

- BOARDS
    - 1983   240,900 UNITS
    - 1986   620,000 UNITS
    - AAGR   37%

- SYSTEMS
    - 1983   5,200 UNITS
    - 1986   36,700 UNITS
    - AAGR   92%

IBM MULTIBUS STUDY
DATA AND FINDINGS

BENEFITS OF HOST ATTACHMENT

- SCIENTIFIC/ENGINEERING PROCESSORS

  - IBM 4361

  - DEC VAX SERIES

  - DATA GENERAL MV SERIES

  - PRIME 750/850 SERIES

  - OTHERS (PERKIN-ELMER, GOULD SEL).

- ARE THERE BENEFITS?

  - 78% YES

  - 22% NO

IBM MULTIBUS STUDY
DATA AND FINDINGS

BENEFITS OF HOST ATTACHMENT

1. APPLICATION SOFTWARE ON HOST.

2. HOST'S NUMBER CRUNCHING CAPABILITY.

3. FREE UP HOST FOR COMPUTE INTENSIVE TASKS.

4. DEVICE GATHERS DATA/HOST PROCESSES DATA.

5. HOST AS PRIMARY CONTROLLER FOR REMOTE
    DEVICES.

6. LARGE UNIVERSE OF HOST PROCESSORS.

7. RESOURCE SHARING.

8. ACCESS TO DATA BASES.

IBM MULTIBUS STUDY
DATA AND FINDINGS

I.   APPLICATION SOFTWARE ON HOST

●   BOARDS,

      -    DATA GATHERING

      -    GRAPHICS

      -    MOTION MEASUREMENT AND CONTORL

●   SYSTEMS

      -    COMMUNICATION GATEWAY

      -    DATA GATHERING

      -    GRAPHICS

      -    MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

2. HOST'S NUMBER CRUNCHING CAPABILITY

● BOARDS

    - COMMUNICATION GATEWAY

    - GRAPHICS

    - MATHEMATICAL PROCESSING

    - MOTION MEASUREMENT AND CONTROL

● SYSTEMS

    - COMMUNICATION GATEWAY

    - DATA GATHERING

    - GRAPHICS

    - MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

3. FREE UP HOST FOR COMPUTE INTENSIVE TASKS

- BOARDS

    - DATA GATHERING

    - GRAPHICS

    - MEASUREMENT OTHER THAN MOTION

    - MOTION MEASUREMENT AND CONTROL

- SYSTEMS

    - DATA GATHERING

    - GRAPHICS

    - IMAGE PROCESSING

    - MATHEMATICAL PROCESSING

4. DEVICE GATHERS DATA/HOST PROCESSES DATA

- BOARDS

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MEASUREMENT OTHER THAN MOTION

  - MOTION MEASUREMENT AND CONTROL

- SYSTEMS

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MATHEMATICAL PROCESSING

  - MEASUREMENT OTHER THAN MOTION

  - MOTION MEASUREMENT AND CONTROL

INPUT

IBM MULTIBUS STUDY
DATA AND FINDINGS

5. HOST AS PRIMARY CONTROLLER FOR REMOTE DEVICES

●   BOARDS

    -   DATA GATHERING

●   SYSTEMS

    -   GRAPHICS

    -   IMAGE PROCESSING

    -   MEASUREMENT OTHER THAN MOTION

    -   MOTION MEASUREMENT AND CONTROL

IBM MULTIBUS STUDY
DATA AND FINDINGS

6.   LARGE UNIVERSE OF HOST PROCESSORS

•   SYSTEMS

    -    COMMUNICATION GATEWAY

    -    DATA GATHERING

    -    GRAPHICS

    -    MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

7.   RESOURCE SHARING

●   BOARDS

        -    COMMUNICATION GATEWAY

        -    GRAPHICS

●   SYSTEMS

        -    DATA GATHERING

        -    GRAPHICS

        -    MATHEMATICAL PROCESSING

IBM MULTIBUS STUDY
DATA FINDINGS

8.   ACCESS TO DATA BASES

●   BOARDS

     -    DATA GATHERING

     -    MOTION MEASUREMENT AND CONTROL

●   SYSTEMS

     -    COMMUNICATION GATEWAY

     -    DATA GATHERING

     -    GRAPHICS

     -    IMAGE PROCESSING

IBM MULTIBUS STUDY
DATA AND FINDINGS

BENEFITS OF HOST ATTACHMENT

1. APPLICATION SOFTWARE ON HOST.

2. HOST'S NUMBER CRUNCHING CAPABILITY.

3. FREE UP HOST FOR COMPUTE INTENSIVE TASKS.

4. DEVICE GATHERS DATA/HOST PROCESSES DATA.

5. HOST AS PRIMARY CONTROLLER FOR REMOTE
   DEVICES.

6. LARGE UNIVERSE OF HOST PROCESSORS.

7. RESOURCE SHARING.

8. ACCESS TO DATA BASES.

IBM MULTIBUS STUDY
DATA AND FINDINGS

NO BENEFITS

- PERCENT INDICATING NO BENEFIT

  - BOARD MAKERS 55%

  - SYSTEM INTEGRATORS 18%

  - BOTH 27%

- BOARDS

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MOTION MEASUREMENT AND CONTROL

- SYSTEMS

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MOTION MEASUREMENT AND CONTROL

IBM MULTIBUS STUDY
DATA AND FINDINGS

CONFIGURATION

	NUMBER OF RESPONDENTS
● COMMUNICATION NETWORK	20
- BOARD MAKERS	1
- SYSTEM INTEGRATORS	12
- BOTH	7
● HOST/SLAVE	9
- BOARD MAKERS	2
- SYSTEM INTEGRATORS	4
- BOTH	3
● COMMUNICATION NETWORK AND HOST/SLAVE	11
- BOARD MAKERS	6
- SYSTEM INTEGRATORS	2
- BOTH	3

IBM MULTIBUS STUDY
DATA AND FINDINGS

LOCAL AREA NETWORKS

- ACCOMMODATES INCOMPATIBLE COMPUTERS AND
  DEVICES'

- SHARING OF RESOURCES, INFORMATION AND COMPUTER
  POWER

- CONNECTIVITY

  - HOST TO HOST
  - DEVICE TO HOST
  - DEVICE TO DEVICE

- 10 MEGABIT PER SECOND TRANSMISSION

- DEVICE SELECTION CRITERIA

  - PERFORMANCE

  - PRICE

  - FUNCTIONALITY

  - NOT INTERFACE SPECIFICATIONS

IBM MULTIBUS STUDY
DATA AND FINDINGS

APPLICATION BY CONFIGURATION

- COMMUNICATION NETWORK

  - COMMUNICATION GATEWAY

  - DATA GATHERING

  - GRAPHICS

  - MATHEMATICAL PROCESSING

  - MOTION MEASUREMENT AND CONTROL

- HOST/SLAVE

  - COMMUNICATION GATEWAY

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MEASUREMENT OTHER THAN MOTION

  - MOTION MEASUREMENT AND CONTROL

INPUT

IBM MULTIBUS STUDY
DATA AND FINDINGS

HOST/SLAVE CONFIGURATION

- OPERATING SYSTEM

- BUS COMPATIBILITY

- MINIMUM DATA RATES

- SPECIAL CONDITIONS

- TYPICAL CONFIGURATION

- SOFTWARE

- MAINTENANCE REQUIREMENTS

IBM MULTIBUS STUDY
DATA AND FINDINGS

OPERATING SYSTEM

- NO "PREFERRED" HOST PROCESSOR, ONLY UNIVERSE OF PROCESSORS "OUT THERE".

- NO "PREFERRED" OPERATING SYSTEM, ONLY "AVAILABLE" OPERATING SYSTEMS.

PROCESSOR	OPERATING SYSTEM
DATA GENERAL MV	AOS, RDOS
DEC VAX	VMS, RSX, UNIX
GOULD-SEL SERIES 32	SEL 32 RTM
IBM 43XX	VM, MVS
PERKIN-ELMER 32-BIT	OS/32
PRIME 750/850	PRIMOS

IBM MULTIBUS STUDY
DATA AND FINDINGS

DETERMINATION OF BUS COMPATIBILITY

- NOT BASED ON HOST PROCESSOR

- BUS STRUCTURE

    - ADVANTAGES

    - DISADVANTAGES

IBM MULTIBUS STUDY
DATA AND FINDINGS

MINIMUM DATA RATES (BOARDS)

- LESS THAN 200 KBITS   55%

    - COMMUNICATION GATEWAY

    - DATA GATHERING

    - GRAPHICS

    - IMAGE PROCESSING

    - MATHEMATICAL PROCESSING

    - MEASUREMENT OTHER THAN MOTION

    - MOTION MEASUREMENT AND CONTROL

    - VOICE SYNTHESIS AND RECOGNITION

- GREATER THAN 200 KBITS   45%

    - DATA GATHERING

    - GRAPHICS

    - VOICE SYNTHESIS AND RECOGNITION

HOST/SLAVE CONFIGURATIONS
BOARDS

APPLICATIONS	MINIMUM DATA RATES (KBITS/S)	
	LT200 (%)	GT200 (%)
MOTION MEASUREMENT AND CONTROL	55	45
DATA GATHERING	50	50
MEASUREMENT OTHER THAN MOTION	67	33
COMMUNICATION GATEWAY	55	45
GRAPHICS	50	50
IMAGE PROCESSING	80	20
VOICE SYNTHESIS/RECOGNITION	50	50
MATHEMATICAL PROCESSING	60	40
ALL APPLICATIONS	55	45

IBM MULTIBUS STUDY
DATA AND FINDINGS

MINIMUM DATA RATES (SYSTEMS)

- LESS THAN 200 KBITS   40%

  - COMMUNICATION GATEWAY

  - DATA GATHERING

  - GRAPHICS

  - MOTION MEASUREMENT AND CONTROL

- GREATER THAN 200 KBITS   60%

  - COMMUNICATION GATEWAY

  - DATA GATHERING

  - GRAPHICS

  - IMAGE PROCESSING

  - MATHEMATICAL PROCESSING

  - MEASUREMENT OTHER THAN MOTION

  - MOTION MEASUREMENT AND CONTROL

HOST/SLAVE CONFIGURATION
SYSTEMS

APPLICATION	MINIMUM DATA RATES (KBITS/S)	
	LT200 (%)	GT200 (%)
MOTION MEASUREMENT AND CONTROL	50	50
DATA GATHERING	50	50
MEASUREMENT OTHER THAN MOTION	33	67
COMMUNICATION GATEWAY	50	50
GRAPHICS	50	50
IMAGE PROCESSING	40	60
VOICE SYNTHESIS/RECOGNITION	NONE	NONE
MATHEMATICAL PROCESSING	0	100
ALL APPLICATIONS	40	60

IBM MULTIBUS STUDY
DATA AND FINDINGS

SPECIAL CONDITIONS

- RELIABILITY

- ENVIRONMENT

IBM MULTIBUS STUDY
DATA AND FINDINGS

TYPICAL CONFIGURATION

● HOST ACCESS

    - ON LINE

● TRANSMISSION FORM

    - RS 232

    - DEC DXX II

    - IBM BUS AND TAG

    - HIGH SPEED DMA

    - PARALLEL HIGH SPEED INTERFACE

    - HIGH SPEED CHANNEL INTERFACE UNIT

IBM MULTIBUS STUDY
DATA AND FINDINGS

TYPICAL CONFIGURATION

- ATTACHED DEPENDENT DEVICES

    - ROBOTIC GRIPPERS

    - FEEDERS

    - PRINTERS

    - HARD DISKS

    - DISPLAYS

- OTHER MICROPROCESSORS

    - NUMERICAL CONTROL EQUIPMENT

    - WORKSTATIONS

MULTIBUS STUDY
DATA AND FINDINGS

SOFTWARE

● COMMUNICATIONS AND CONTROL SOFTWARE VS. APPLICATION SOFTWARE.

● COMMUNICATIONS AND CONTROL SOFTWARE CHARACTERISTICS.

- CUSTOM BUILT

- DEVELOPED BY DEVICE VENDOR.

- USED FOR

  . HANDLING COMMUNICATIONS PROTOCOLS
  . ERROR CHECKING
  . QUEUING OF DEVICES CONTROLLED BY HOST

● LANGUAGES USED

- ASSEMBLER

- "C"

- FORTRAN

- MACHINE LANGUAGE

IBM MULTIBUS STUDY
DATA AND FINDINGS

MAINTENANCE REQUIREMENTS

- "TYPICAL" COMPUTER MAINTENANCE

- NO "SPECIAL" MAINTENANCE REQUIREMENTS

IBM MULTIBUS STUDY
DATA AND FINDINGS

SENSITIVITY TO PRICE CHANGES

- ALL RESPONDENTS   PERCENT

  - SENSITIVE   51

  - INSENSITIVE   39

  - NO OPINION   10

- BOARD MAKERS

  - SENSITIVE   67

  - INSENSITIVE   33

- SYSTEM INTEGRATORS

  - SENSITIVE   50

  - INSENSITIVE   50

- "WITHIN BANDS OF PRICE CHANGES, CUSTOMERS ARE INSENSITIVE."

- "CUSTOMERS BECOME SENSITIVE PAST 10-15%."

IBM MULTIBUS STUDY
DATA AND FINDINGS

SENSITIVITY TO PRICE CHANGES

- FACTORS OTHER THAN PRICE

    - PERFORMANCE

    - CUSTOMER'S APPLICATION REQUIREMENTS

    - AVAILABILITY

    - QUALITY

IBM MULTIBUS STUDY
DATA AND FINDINGS

EXPERT USERS

- DEVICES

    - SCIENTIFIC AND ENGINEERING WORKSTATIONS

- CONFIGURATION

    - COMMUNICATIONS NETWORK

- DATA TRANSMISSION RATES

    - IMMEDIATE RESPONSE NOT NEEDED

- SOFTWARE

    - CUSTOM BUILT

    - COMMUNICATIONS PROTOCOLS

- LANGUAGES

    - "C"

IBM MULTIBUS STUDY

CONCLUSIONS

- APPLICATION AREAS

  - DATA GATHERING

  - GRAPHICS

  - MOTION MEASUREMENT AND CONTROL

  - COMMUNICATION GATEWAY

- PRIMARY CUSTOMERS

  - OEM'S AND SYSTEM INTEGRATORS

  - CAD/CAM USERS

  - FACTORY FLOOR AUTOMATION

  - CONTROLS FOR PROCESS MANUFACTURING INDUSTRIES

IBM MULTIBUS STUDY

CONCLUSIONS

- BUS STRUCTURE

    - MULTIBUS

- BENEFITS OF HOST ATTACHMENT

    - APPLICATION SOFTWARE ON HOST

    - HOST'S NUMBER CRUNCHING CAPABILITY

    - FREE UP HOST FOR COMPUTE INTENSIVE TASKS

    - DEVICE GATHERS DATA/HOST PROCESSES DATA

- CONFIGURATION

    - COMMUNICATIONS NETWORK

1. Our research indicates that (Name of Company) is primarily a:

    _____ micro computer board maker

    _____ system integrator

    _____ both

2. Do the (boards/systems) that you (make/develop) have application in any of the following areas?

	YES	NO
Motion measurement and control (e.g., robotics)	____	____
Data gathering (e.g., seismic, quality control inspection factory floor operation)	____	____
Measurement, other than motion (e.g. optical and tactile sensors)	____	____
Use in communication gateways (e.g. local area networks X.25 packet networks)	____	____
Graphics (e.g., business, scientific/ engineering graphics)	____	____
Image processing (e.g. satellite photographic analysis, video security)	____	____
Voice synthesis and recognition	____	____
Mathematical processing (e.g., high speed array processors)	____	____

3. Which of these (boards/systems) are compatible with Intel's Multibus? If not compatible with Multibus, with what bus structures are they compatible?

	INTEL MULTIBUS	DEC UNIBUS	DEC Q-BUS	MOTOROLA VERSABUS	MOTOROLA VMEBUS	S-100	PRO-LOG STDBUS
Motion measurement and control (e.g., robotics)							
Data gathering (e.g., seismic, quality control inspection factory floor operation)							
Measurement, other than motion (e.g. optical and tactile sensors)							
Use in communication gateways (e.g. local area networks X.25 packet networks)							
Graphics (e.g., business, scientific/ engineering graphics)							
Image processing (e.g. satellite photographic analysis, video security)							
Voice synthesis and recognition							
Mathematical processing (e.g., high speed array processors)							

4.   A. What was the unit sales volume in 1983 for:

        Boards _____
        Systems _____

      B. What unit sales volume is forecast for 1986?

        Boards _____
        Systems _____

5a.   What are the benefits, if any, of using your (boards/system) in a configuration
      with a processor such as IBM 4361, DEC VAX, DG MV Series, PRIME, Other:

      _____
      _____
      _____
      _____

5b.   Are there any applications, other than those discussed, which would benefit
      from attachment to a host processor?

      <u>APPLICATION</u>   <u>HOST</u>   <u>BENEFITS</u>   <u>BUS COMPATIBILITY</u>

      _____
      _____
      _____
      _____

6a.   Please describe the typical configuration in which these (boards/systems) are used.

_____
_____
_____
_____
_____
_____

6b.   Is the host on-line or is access through a media interchange?

_____
_____
_____
_____
_____
_____
_____
_____

6c.   What is the transmission form?

_____
_____
_____
_____
_____
_____
_____

6d.   What are the attached dependent devices?

_____
_____
_____
_____

6e.   What other microprocessors, if any, are involved in this configuation?

_____

_____

_____

_____

6f.   From whom can these boards/systems be obtained?   _____

_____

_____

7a.   If attachment to a host processor is beneficial, what operating system is used
on the host? Why?   _____

_____

_____

_____

_____

7b.   Are there any other operating systems that are preferred? Why?   _____

_____

_____

_____

_____

8.   Is the determination of microcomputer bus compatibility based strictly on
which host processor is used, or are there advantages to particular
microcomputer bus structures?   _____

_____

_____

9. For those application which benefit from host connection (question 5) are the minimum data rates required less than 200 KBits or greater than 200 KBits.

BOARDS
- 200 KBits _____
+ 200 KBits _____

SYSTEMS
- 200 KBites _____
+ 200 KBits _____

10. What special conditions are associated with host attachment:

Distance _____

Environment _____

High Reliability _____

Special Hardware _____

Other _____

_____

_____

11a. Is there any software or firmware needed to support the attachment of these (boards/systems) to the host computer? _____

_____

_____

_____

11b.   If there is software or firmware, can you please provide:

Description: _____

_____

_____

Interfaces: _____

_____

_____

Documentation: _____

_____

_____

Sources (Vendors):   _____

_____

_____

By whom is it written: _____

_____

_____

What language is it written in?   _____

_____

_____

12.   What are the maintenance requirements needed to support the connection of
these (boards/systems) to the host computer?   _____

_____

_____

13. Who are your primary customers for these (boards/systems) by industry or type of user?

_____

_____

_____

_____

14. Please give a description of the typical user, including the computing environment.

_____

_____

_____

_____

15. How sensitive are your users to changes in the prices of the (boards/systems)?

_____

_____

_____

_____